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(54) **CASTER**

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***B60B 33/00*** (2006.01)
*A47B 91/00* (2006.01)

(52) **U.S. Cl.** ..... **16/31 R**; 16/18 R; 16/39

(58) **Field of Classification Search** ..... 16/20, 16/18 R, 45, 21, 24, 25, 37, 38, 39, 31 R, 16/40, 42 T
See application file for complete search history.

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(57) **ABSTRACT**

A moveable body includes at least one caster. The caster has a yoke, a wheel supported on the yoke, and an interface member for attaching the caster to the moveable body. Additionally, the caster is configured so that a noise level of the moveable body as the moveable body travels over a surface is approximately 85 decibels or less.

**6 Claims, 5 Drawing Sheets**

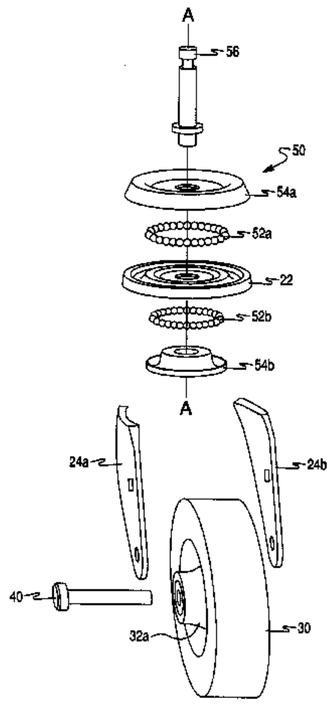

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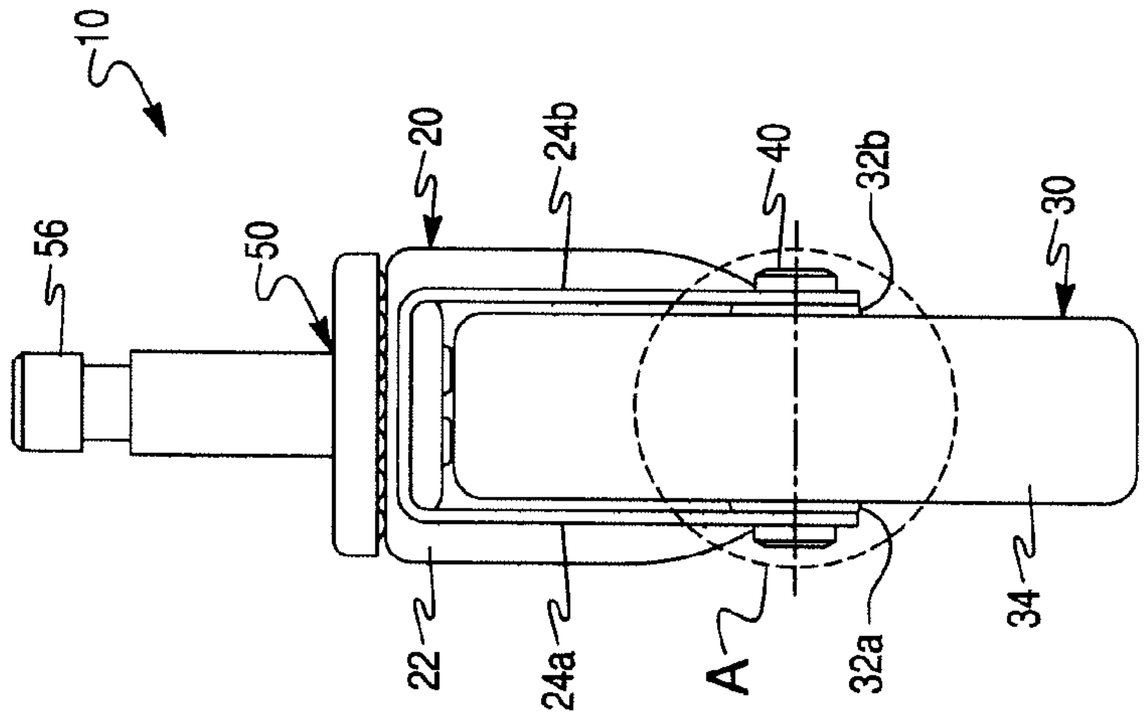
Fig. 2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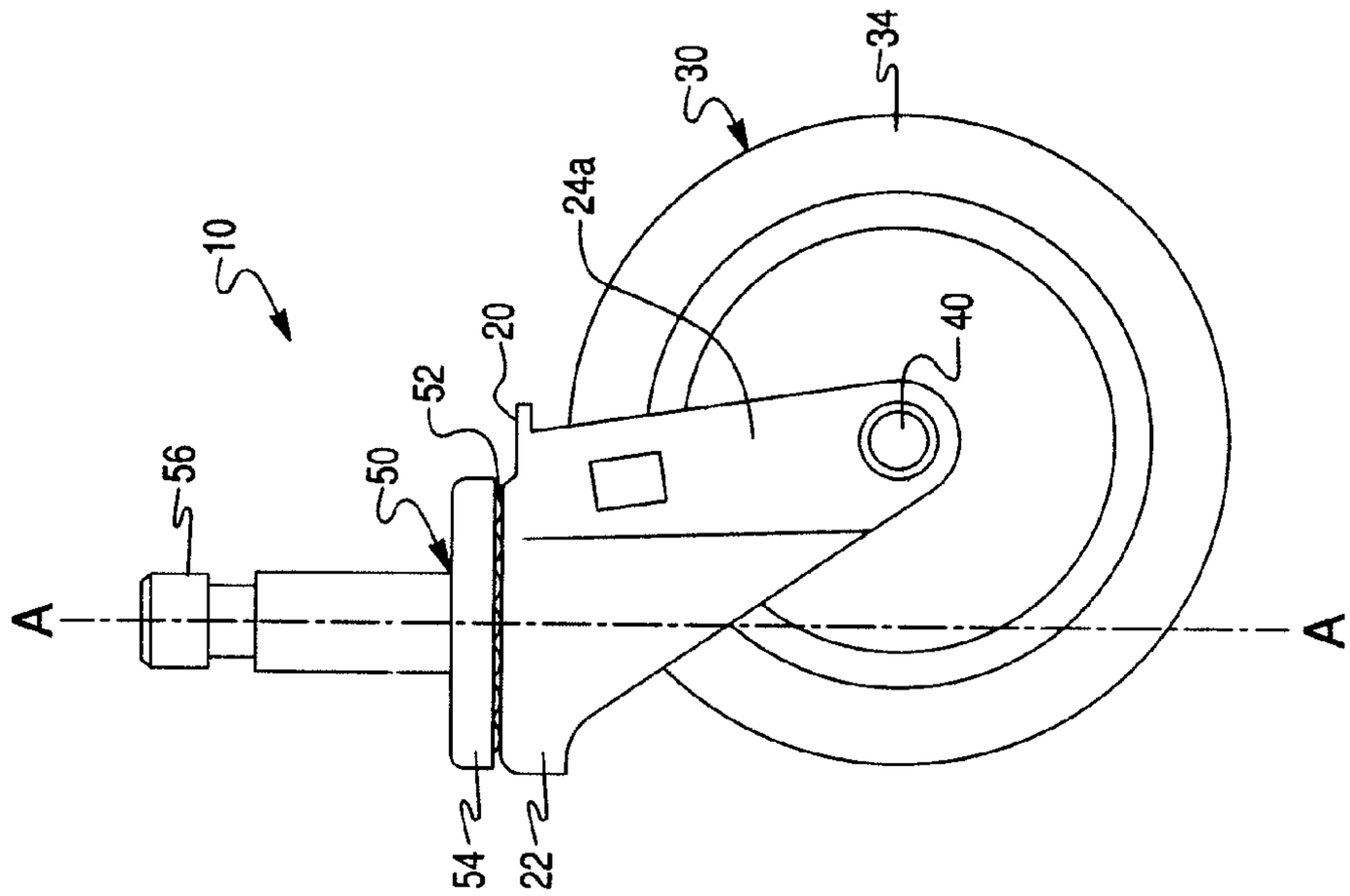
20
24b
40
32b
30
56
50
22
24a
A
32a
34

Fig. 1


10
24a
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34
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52
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56
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A
A
54
22

Fig. 3A

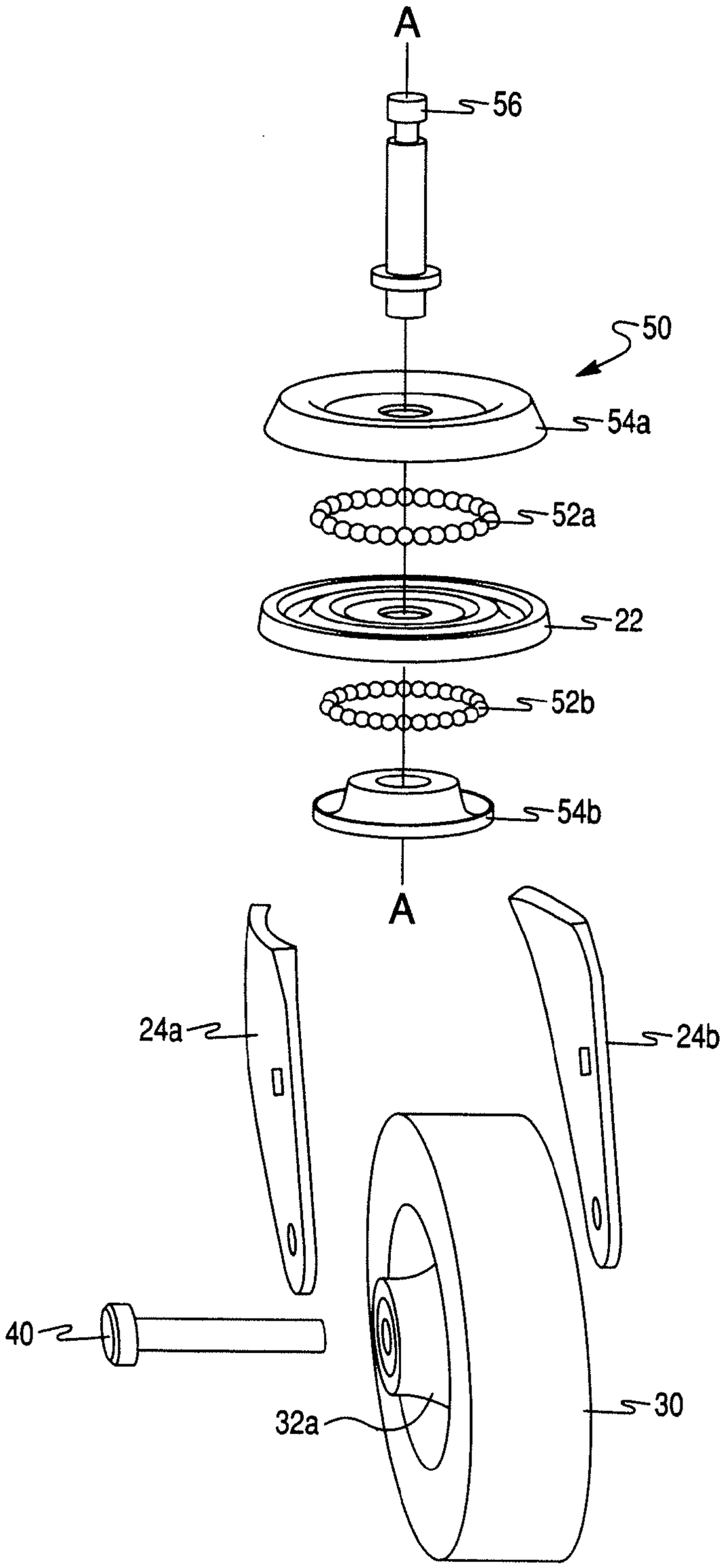


Fig. 3B

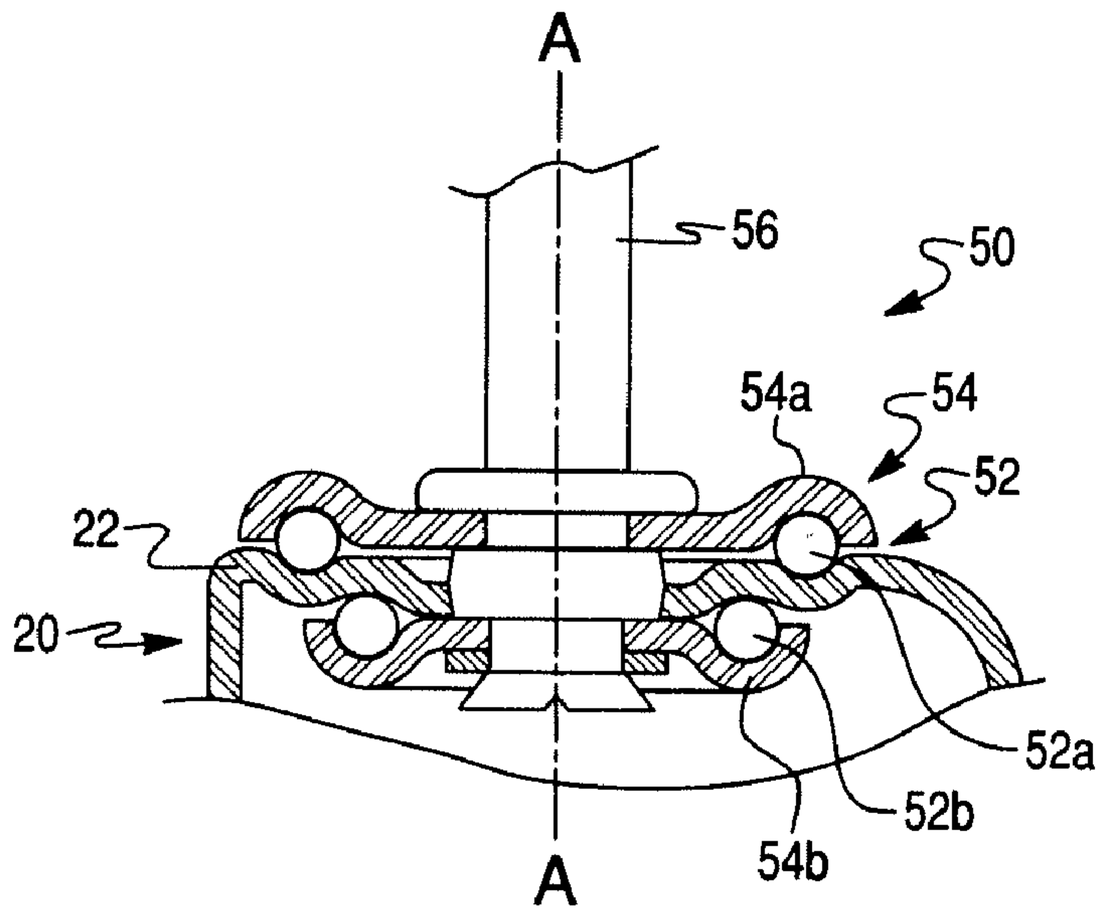



Fig. 4A

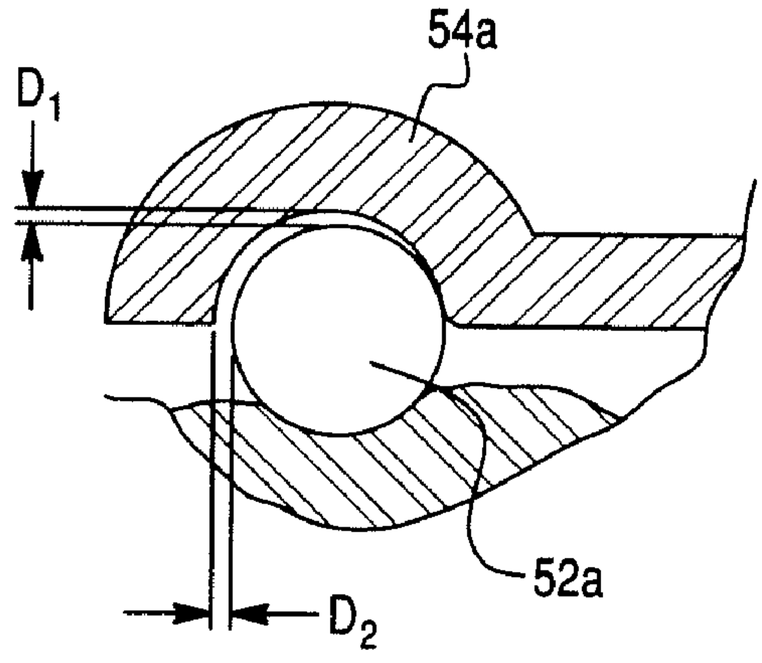


Fig. 4B

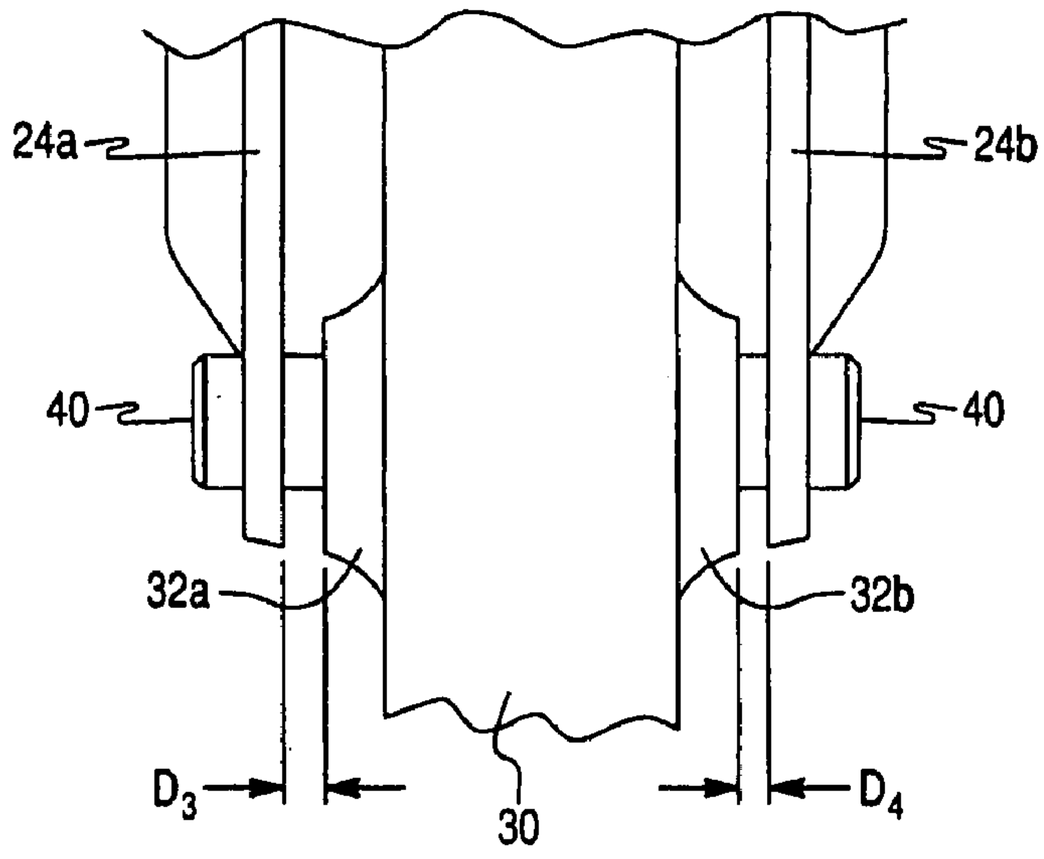



Fig. 4C

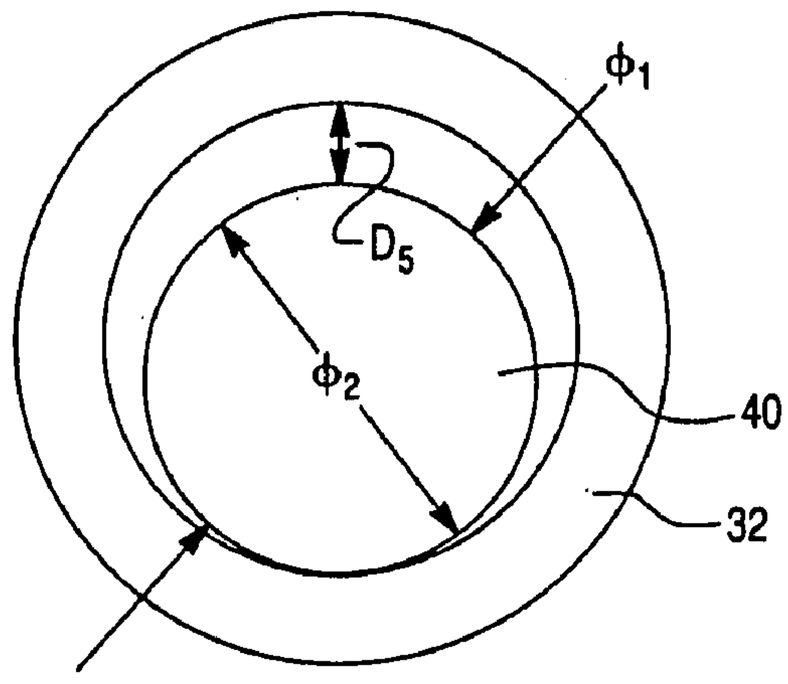


Fig. 5

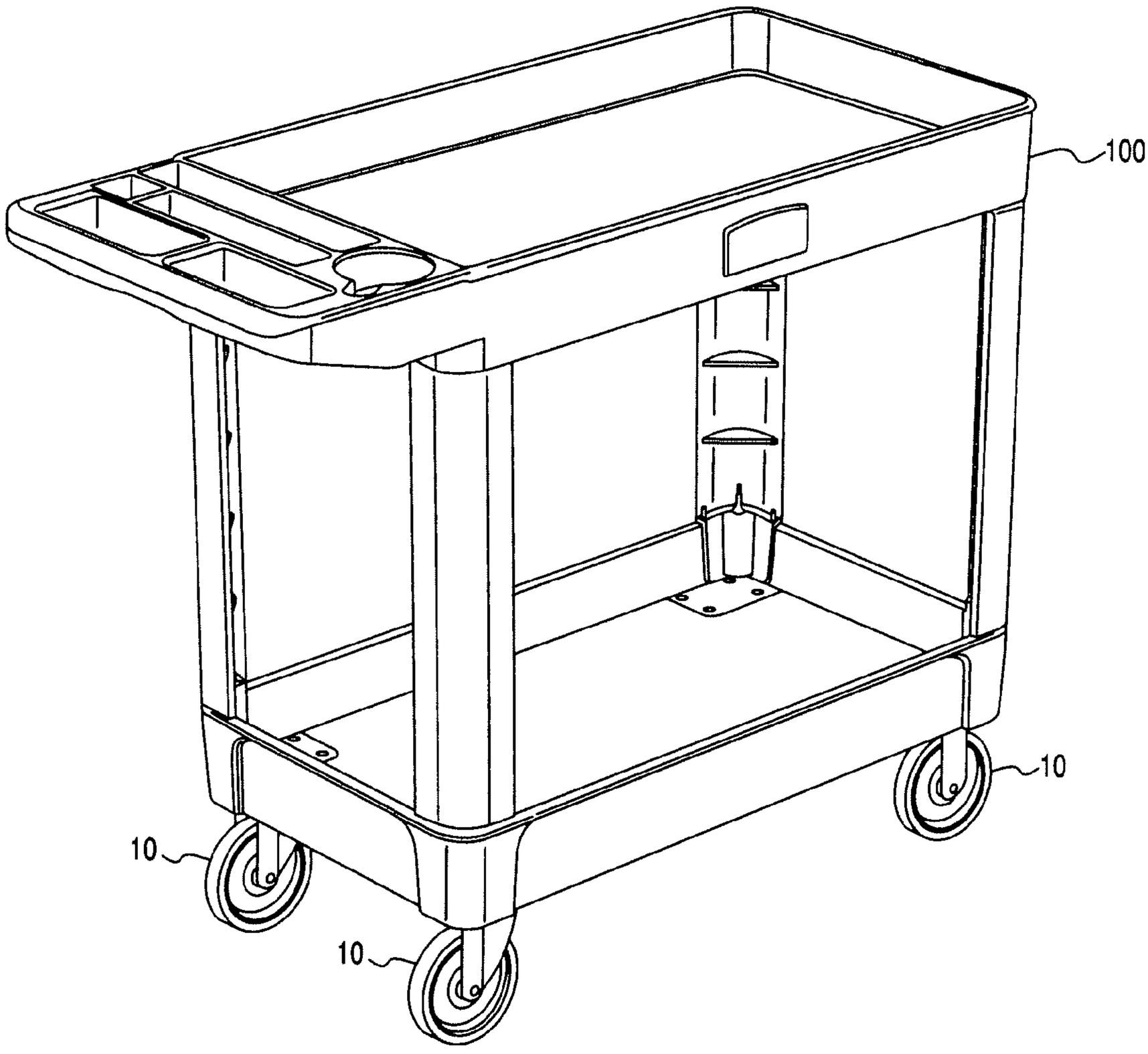
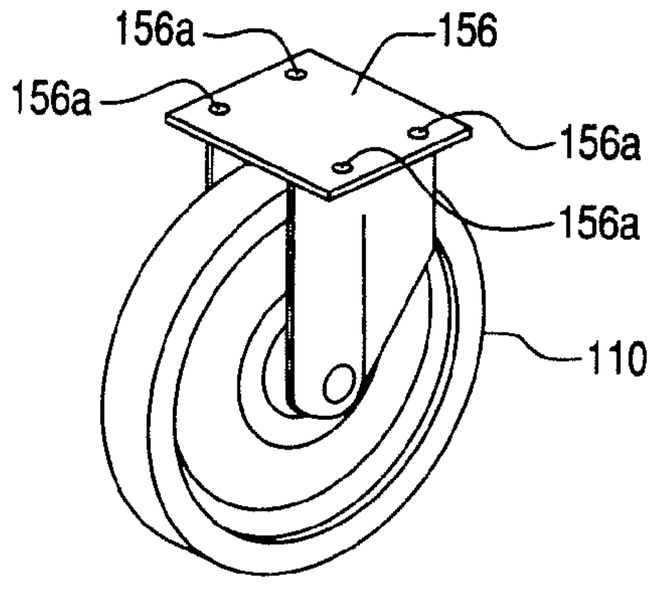



Fig. 6



# CASTER

## BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a caster and, more particularly, to a caster having improved vibratory characteristics.

2. Description of Related Art

Traditionally, casters have been incorporated onto a moveable object to create a transport system that can be moved from one location to another. For example, dollies and carts have been outfitted with casters and used to transport heavy items such as boxes, supplies, tools, and equipment. Selection of an appropriate caster for a particular application is determined by various factors, including load weight, operating environment, and floor condition.

A conventional transport system incorporating casters generates noise as the transport system moves over a surface due to vibration caused by excessive movement of components in the caster assembly. In certain environments, such as hospitals, long-term care facilities, schools, and offices, excessive noise is unacceptable. Accordingly, the Occupational Safety and Health Administration (OSHA) has developed regulations setting forth acceptable noise exposure levels for various workplace environments. Moreover, noise generated by conventional transport systems restricts the time certain activities can be conducted. For example, cleaning carts using conventional casters can disrupt classes in schools and meetings in offices if cleaning takes place during the day. Similarly, such cleaning carts can disrupt sleeping patients in hospitals and care facilities if cleaning takes place at night.

In an effort to reduce noise generated by conventional transport systems, devices such as sound absorbers and vibration dampers (e.g., lead base tape) have been employed. Such devices can be installed on the transport system to absorb vibration and/or deaden its travel. Additionally, some conventional casters utilize a softer tread material to absorb vibration. One disadvantage of such devices is that they do not sufficiently reduce noise generated by the transport system. Another disadvantage of such devices is that they merely absorb vibration and/or deaden its travel but do not eliminate the source of the vibration.

## SUMMARY OF THE INVENTION

An aspect of the present invention relates to a caster. The caster includes a yoke, a wheel including a hub, an axle, and an interface member for attaching the yoke to a moveable body. The yoke has a support member and first and second legs extending from an underside of the support member. The wheel has a first end disposed adjacent the first leg of the yoke and a second end disposed adjacent the second leg of the yoke, and the axle extends through the hub to rotatably support the wheel between the first and second legs of the yoke. The interface member has a first portion provided on the support member of the yoke and a second portion facing the first portion and being configured such that the yoke can swivel about a vertical axis relative to the second portion. A vertical clearance between the first and second portions of the interface member is approximately 0.02 inches or less. A total clearance between the first and second ends of the hub and the first and second legs of the yoke is approximately 0.032 inches or less. A clearance between an inner diameter of the hub and an outer diameter of the axle is approximately 0.008 inches or less. The wheel includes a tread material having a Shore A hardness of approximately 65 durometers or less.

Another aspect of the present invention relates to a moveable body. The moveable body includes at least one caster. The caster has a yoke, a wheel supported on the yoke, and an interface member for attaching the caster to the moveable body. Additionally, the caster is configured so that a noise level of the moveable body as the moveable body travels over a surface is approximately 85 decibels or less.

Yet another aspect of the present invention relates to a caster. The caster includes a yoke including a support member and first and second legs extending from an underside of the support member, a wheel rotatably supported between the first and second legs of the yoke by an axle, and an interface member for attaching the yoke to a moveable body. The interface member has a first portion provided on the support member of the yoke and a second portion facing the first portion and being configured such that the yoke can swivel about a vertical axis relative to the second portion. A vertical clearance between the first and second portions of the interface member is approximately 0.02 inches or less.



## BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate a preferred embodiment of the invention and together with the description, serve to explain principles of the invention.

FIG. **1** is a side elevation view of an embodiment of a caster according to the present invention.

FIG. **2** is a front elevation view of the caster of FIG. **1**.

FIG. **3***a* is an exploded perspective view of the caster of FIG. **1**.

FIG. **3***b* is a cross sectional view of an interface member of the caster of FIG. **1**.

FIG. **4***a* is an enlarged view of detail B of FIG. **3***b*.

FIG. **4***b* is an enlarged view of detail A of FIG. **2**.

FIG. **4***c* is an enlarged side elevation view of a hub and an axle of the caster of FIG. **1**.

FIG. **5** is a perspective view of a moveable body that incorporates the caster of FIG. **1**.

FIG. **6** is a perspective view of an embodiment of a caster according to the present invention.

## DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

Reference will now be made in detail to a presently preferred embodiment of the invention, an example of which is illustrated in the accompanying drawings. An effort has been made to use the same reference numbers throughout the drawings to refer to the same or like parts.

FIGS. **1** to **4***c* show an embodiment of a caster **10** according to the present invention. The caster **10** can be connected to a moveable body **100**, as shown in FIG. **5**, to enable the moveable body **100** to be transported from one location to another. The caster **10** includes a yoke **20**, a wheel **30**, an axle **40**, and an interface member **50**.

The yoke **20** includes a support member **22**, a first leg **24***a*, and a second leg **24***b*. The first and second legs **24***a* and **24***b* extend from an underside of the support member **22**. As shown in FIG. **2**, the first and second legs **24***a* and **24***b* are spaced apart from one another to accommodate the wheel **30**. The first and second legs **24***a* and **24***b* can be connected to the support member **22** by conventional means, which may include being integrally formed.

The wheel **30** is disposed between the first and second legs **24***a* and **24***b* of the yoke **20**. The wheel **30** includes a hub **32** located at a central portion of the wheel **30** so that the inner diameter of the hub **32** corresponds to the inner diameter of the wheel **30**. The hub **32** has a first end **32***a* located adjacent the first leg **24***a* of the yoke **24** and a second end **32***b* located adjacent the second leg **24***b* of the yoke **24**. As shown in FIG. **2**, the first and second ends **32***a* and **32***b* of the hub **32** constitute the outermost side portions of the wheel **30**. The axle **40** extends through the hub **32** to rotatably support the wheel **30** between the first and second legs **24***a* and **24***b* of the yoke **24**.

The wheel **30** also can include a tread **34** that engages a surface as the wheel **30** rolls over the surface. The tread **34** can be made of a material that has a Shore A hardness of approximately 65 durometers or less. Preferably the tread material has a Shore A hardness in the range of approximately 10 to 65 durometers. More preferably, the tread material has a Shore A hardness in the range of approximately 40 to 65 durometers. The tread material can be a non-marking thermoplastic rubber. Additionally, the tread material can be colored to distinguish the caster **10** from a conventional caster.

The interface member **50** connects the yoke **20** to the moveable body **100**. The interface member **50** includes a first portion **52** and a second portion **54**. The first portion **52** is provided on the support member **22** of the yoke **20**. The second portion **54** faces the first portion **52** and can be configured so that the yoke **20** can swivel about a vertical axis A-A relative to the second portion **54**. For example, as shown in FIGS. **3***a* and **3***b*, the interface member **50** can be a swivel bearing where the first portion **52** includes ball bearings **52***a* and the second portion **54** includes a raceway **54***a*. The ball bearings **52***a* travel about the raceway **54***a* thereby enabling the yoke **20** to swivel. Preferably, the interface member **50** includes a steel double ball race having two rows of ball bearings **52***a* and **52***b* that permit independent movement of the raceways **54***a* and **54***b* relative to the support member **22**, as shown in FIG. **3***a*.

The interface member **50** also includes an attachment member **56** for attaching the interface member to the moveable body **100**. As shown in FIGS. **1** and **2**, the caster **10** can be a stem caster, and the attachment member **56** can be a stem that is adapted to be received in an underside of the moveable body **100**. As shown in FIG. **3***a*, the stem **56** can be assembled with the first portion **52** and the second portion **54** of the interface member **50**. The stem **56** can then be staked in a conventional manner to hold the swivel assembly together. Alternatively, as shown in FIG. **6**, a caster **110** can be a plate caster, and the attachment member **156** can be a plate that includes apertures **156***a* for mounting the attachment member **156** to the underside of a moveable body with fasteners such as bolts or screws.

The caster **10** is configured to reduce relative movement between the various components of the caster assembly so that vibration from the caster **10** as the caster **10** moves over a surface is reduced. For example, as shown in FIG. **4***a*, a total vertical clearance $D_1$ can exist between the first portion **52** and the second portion **54** of the interface member **50** when the interface member **50** and the yoke **20** are pulled apart (i.e., pulled in opposite directions). Total clearance refers to the maximum amount the components can be moved apart from one another by, for example, pulling them apart while the caster **10** is in the assembled condition. The total vertical clearance $D_1$ is preferably approximately 0.02 inches or less. For example, the total vertical clearance $D_1$ may be in the range of approximately 0.005 to 0.02 inches.



Preferably, the total vertical clearance $D_1$ is approximately 0.005 to 0.01 inches. In other words, the interface member **50** is configured to allow no more than approximately 0.02 inches of vertical motion between the first portion **52** and the second portion **54**. Additionally, a total side clearance $D_2$ between the first portion **52** (e.g., the ball bearing) and the second portion **54** (e.g., the raceway) is preferably approximately 0.05 inches or less. In other words, the interface member **50** is configured to allow no more than approximately 0.05 inches of horizontal travel from side-to-side.

A total clearance between the first and second ends **32***a* and **32***b* of the hub **32** and the first and second legs **24***a* and **24***b* of the yoke **20** is preferably approximately 0.032 inches or less. As shown in FIG. **4***b*, the total clearance is the sum of a clearance $D_3$ between the outermost side portion of the wheel **30** adjacent the first leg **24***a* and the first leg **24***a* and a clearance $D_4$ between the outermost side portion of the wheel **30** adjacent the second leg **24***b* and the second leg **24***b*. Thus, the total clearance is the sum of $D_3$ and $D_4$. The total clearance ($D_3$+$D_4$) may be, for example, in the range of approximately 0.021 to 0.032 inches. Preferably, the total clearance ($D_3$+$D_4$) is in the range of approximately 0.01 to 0.02 inches. Additionally, as shown in FIG. **4***c*, a total clearance $D_5$ between an inner diameter of the hub $\Phi_1$ and an outer diameter of the axle $\Phi_2$ is preferably approximately 0.008 inches or less.

Because the caster **10** is designed so that excessive movement between the components of the caster **10** is reduced, a noise level of the moveable body **100** as the moveable body **100** travels over a surface can be approximately 85 decibels or less. As a result, the moveable body **100** has an improved ability to comply with OSHA regulations and therefore is highly suitable for use in environments such as hospitals, long-term care facilities, schools, and offices. Moreover, activities requiring use of the moveable body (e.g., cleaning) are not restricted to certain times of the day. Thus, cleaning carts employing the caster **10** can be used during the day in schools and offices because such carts will not generate noise that will disturb students and office workers. Additionally, such carts can be used in hospitals and care facilities even when patients are sleeping. Moreover, the cost of the moveable body **100** may be reduced because after-market sound absorbers and vibration dampers do not need to be installed on the moveable body **100**.

Other embodiments of the invention will be apparent to those skilled in the art from consideration of the specification and practice of the invention disclosed herein. It is intended that the specification and examples be considered as exemplary only.

What is claimed is:

**1**. A caster, comprising:

a yoke including a support member and first and second legs extending from an underside of the support member;

a wheel including a hub having a first end disposed adjacent the first leg of the yoke and a second end disposed adjacent the second leg of the yoke;

an axle extending through the hub to rotatably support the wheel between the first and second legs of the yoke; and

an interface member for attaching the yoke to a moveable body, the interface member including a first portion provided on the support member of the yoke and a second portion facing the first portion and being configured such that the yoke can swivel about a vertical axis relative to the second portion,

wherein a total vertical clearance between the first and second portions of the interface member is approximately 0.02 inches or less,

wherein a total clearance between the first and second ends of the hub and the first and second legs of the yoke is approximately 0.032 inches or less,

wherein a total clearance between an inner diameter of the hub and an outer diameter of the axle is approximately 0.008 inches or less, and

wherein the wheel includes a tread material having a Shore A hardness of approximately 65 durometers or less.

**2**. The caster of claim **1**, wherein the tread material comprises a non-marking thermoplastic rubber.



**3**. The caster of claim **1**, wherein the interface member includes a ball bearing and a raceway, and wherein a total side clearance between the ball bearing and the raceway is approximately 0.050 inches or less.

**4**. The caster of claim **1**, wherein the caster is a plate caster.

**5**. The caster of claim **1**, wherein the caster is a stem caster.

**6**. The caster of claim **5**, wherein the interface member includes a bearing having a steel double ball race.

* * * * *